

Remarks

Applicant has cancelled originally filed claims 2 and 3 without prejudice. Applicant would like to point out to the Examiner that amended versions of canceled claims 2 and 3 have been added as new claims 19 and 33 respectively. Accordingly, the present application has independent claims 1, 19, and 33, with claims 4-18, 20-32, and 33 dependent respectively thereto.

Applicant hereby submits voluntary amendments of original claims 1, 2, 3, now given as amended claim 1, and new claims 19 and 33 respectively. Applicant does not consider the foregoing amendments as narrowing amendments related to a statutory requirement. On the contrary, Applicant considers the scope of amended claim 1 and new claims 19 and 33 to be at least the same scope as that of previously filed respective claims 1, 2, and 3.

In particular regard to amended claim 1; "block of voxels" was replaced by an approximate volume containing a selected number of regions, "means for defining" was replaced by an input device with related functional and/or structural language, "means for removing" and "means for generating" were replaced by an operator with associated functional and/or structural language related to mask generation and use, "mask from a feature block" was replaced by a mask, and "means for rendering" was replaced by a volume renderer with related functional and/or structural language.

In particular regard to new claim 19, an amended version of previous claim 2; Applicant has replaced "block of voxels" similarly with an approximate volume containing a selected number of regions, the step of "removing from the dataset" was replaced by the steps of generating and specifying to correspond to the distinction of an approximate volume with regions, and "a feature block generating a mask" was replaced by a mask to conform to the replaced definition of the block of voxels. Similarly, Applicant has provided related further clarification of these replaced term in new claim 19 with respective functional and/or structural language to further define the scope of the present invention as originally intended.

In particular regard to new claim 33, an amended version of previous claim 3; Applicant has replaced "the block of voxels" similarly with an approximate volume and a number of regions, "the visual feature" was replaced with a cross section of said object, "remove from the dataset" was replaced by through interpolation of the approximate volume to eventually specify a plurality of voxels not containing said object, "the feature block" was replaced with a mask, and "to render the" was replaced by rendering to extract said object. Similarly, Applicant has provided related further clarification of these replaced terms in new claim 33 with functional and/or structural language to further define the scope of the present invention as originally intended.

In view of the above discussed replacements, Applicant has hereby provided related further clarifications of these replaced terms in amended claim 1 and new claims 19 and 33 to further define the present invention as originally intended with original claims 1, 2, and 3. Accordingly, Applicant does not consider these clarifications as narrowing amendments related to a statutory requirement. Further, Applicant submits the replaced terms and further clarification do not introduce new matter into the present application.

Furthermore, the above described amendments to claim 1 and presented new claims 19 and 33 are intended to provide the prosecuted claims in the US application to such interpretation as may be given in corresponding foreign applications. Applicant notes that a number of the claim elements of original claims 1, 2, 3, such as for example "means for defining" and "means for removing", can be narrowly interpreted under 35 U.S.C. 112(6) in regard to means plus function claim limitations. However, according to patent prosecution practices in many other foreign jurisdictions, these "means" terms can be given a broader purposive construction. Accordingly, Applicant has amended the originally filed claim 1, and presented new claims 19 and 33 to conform to US prosecution practice.

In addition, Applicant has added new dependent claims 4-18, 20-32, and 34 to further

define the scope of the invention as originally intended. Accordingly, Applicant considers these new claims to provide additional embodiments of the present invention as deemed appropriate to the disclosure as originally filed. Applicant submits that claiming these additional embodiments was only considered for inclusion after the US application was filed. Further, Applicant submits these new dependent claims do not introduce new matter into the present application.

In view of the above, Applicant considers the present application in condition for allowance and early consideration to that effect is respectfully requested.

Applicant attaches hereto a document entitled "Version With Markings To Show Changes Made", which is a marked-up version of the changes made to the present application by the above amendment.

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Date

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. (amended) A system of extracting a visual feature from a volumetric dataset using an approximate volume, the system comprising:
 - a) a display means for displaying said volumetric the dataset;
 - b) means an input device for defining a block of voxels corresponding to a selected portion number of regions distributed in of the displayed volumetric dataset, the block each of the regions containing the a cross section of said visual feature therein;
 - c) means for removing from the block of voxels an interpolator for generating the approximate volume containing the selected regions, the approximate volume comprising a set of voxels selected from said volumetric dataset;
 - d) an operator for specifying a plurality of voxels not containing the said visual feature in said set of voxels to generate a feature block mask; means for generating a mask from the feature block and
 - e) means for rendering a volume renderer for using said mask to render said volumetric the dataset to extract said visual feature therefrom; wherein the selected number of regions are a subset of the total number of images contained in said volumetric dataset.

2. (cancelled) A method for extracting a visual feature from a dataset representing an image of an object, said method comprising the steps of:
 - a) displaying said dataset;
 - b) defining a block of voxels corresponding to a selected portion of said displayed dataset, aid block containing said visual feature therein;
 - c) removing from said dataset voxels not contained by said selected portion, to generate a feature block;
 - d) generating a mask from said feature block; and
 - e) rendering said dataset using said mask.

3. (cancelled) An article of manufacture comprising:

- a) a computer usable medium having computer readable program code embodied therein for extracting a visual feature from a dataset representing an image of an object, the computer readable program code in said article of manufacture comprising:
- b) computer readable program code configured to cause a computer to display said dataset;
- c) computer readable program code configured to cause a computer to define a block of voxels corresponding to a selected portion of said displayed dataset, said block containing said visual feature therein;
- d) computer readable program code configured to cause a computer to remove from said dataset voxels not contained by said selected portion, to generate a feature block;
- e) computer readable program code configured to cause a computer to generate a mask from said feature block; and
- f) computer readable program code configured to cause a computer to render said dataset using said mask.

4. (new) The system according to claim 1, wherein the function of the operator is selected from the group comprising; specifying a region to be removed, and specifying a region to be visualized.

5. (new) The system according to claim 4, wherein the operator classifies a transfer function selected from the group comprising; opacity, color, texture, and rendering mode.

6. (new) The system according to claim 4, wherein said volumetric dataset comprises a set of cross sectional images.

7. (new) The system according to claim 6, wherein each of the regions are polygons located on the surface of the corresponding selected cross sectional images.

8. (new) The system according to claim 7, wherein the selected regions are oriented in a parallel spaced apart spatial relationship.

9. (new) The system according to claim 7, wherein the set of cross sectional images are selected from the group comprising planar, arbitrary, and curved reformat slice stacks.

10. (new) The system according to claim 6, wherein the number of regions is less than the number of cross sectional images contained in the set.

11. (new) The system according to claim 4, wherein the regions are used by the interpolator to generate a plurality of approximate volumes for said volumetric dataset.

12. (new) The system according to claim 11, wherein said plurality of approximate volumes are used to define multiple ones of the masks.

13. (new) The system according to claim 12, further comprising a jigsaw tool to generate at least one of the plurality of approximate volumes.

14. (new) The system according to claim 13, wherein the jigsaw tool extrudes a cylindrical approximate volume from one of the regions.

15. (new) The system according to claim 14, wherein the direction of the extrusion is normal to the surface upon which the region is defined.

16. (new) The system according to claim 4 further comprising an iterator for interactively applying the interpolator and the operator to the selected number of regions.

17. (new) The system according to claim 16, wherein duplicate rendering pathways are employed by the iterator for facilitating interactive sculpting.

18. (new) The system according to claim 17, wherein a down-sampled version of the volumetric dataset is employed during interactive sculpting.

19. (new) A method for extracting a visual feature from a volumetric dataset, using an approximate volume, the method comprising the steps of:

- a) displaying said volumetric dataset;
- b) defining a selected number of regions distributed in the displayed volumetric dataset, each of the regions containing a cross section of said visual feature therein;
- c) generating through interpolation the approximate volume comprising a set of voxels selected from said volumetric dataset;
- d) specifying a plurality of voxels not containing said visual feature in said set of voxels to generate a mask; and
- e) rendering using said mask on said volumetric dataset to extract said visual feature therefrom;

wherein the selected number of regions are a subset of the total number of images contained in said volumetric dataset.

20. (new) A method according to claim 19 further comprising the step of selecting the function of the operator from the group comprising: specifying a region to be removed, and specifying a region to be visualized.

21. (new) The method according to claim 20 further comprising the step of classifying the plurality of voxels by a transfer function selected from the group comprising: opacity, color, texture, and rendering mode.

22. (new) The method according to claim 20, wherein said volumetric dataset comprises a set of cross sectional images.

23. (new) The method according to claim 22, wherein each of the regions of polygons are located on the surface of the corresponding selected cross sectional image.

24. (new) The method according to claim 23, wherein the set of cross sectional images are selected from the group comprising planar, arbitrary, and curved reformat sliced stacks.

25. (new) The method according to claim 22, wherein the number of regions is less than the number of cross sectional images contained in the set.

26. (new) The method according to claim 20 further comprising the step of interpolating between the selected regions to generate a plurality of the approximate volumes for said volumetric data set.

27. (new) The method according to claim 26 further comprising the step of defining multiple ones of the masks using said plurality of approximate volumes.

28. (new) The method according to claim 27 further comprising a step of extruding a cylindrical approximate volume from one of the regions.

29. (new) The method according to claim 28, wherein the direction of the extrusion is normal to the surface upon which the region is defined.

30. (new) The method according to claim 20 further comprising the step of interactively performing the step of generating to interpolate the approximate volume and the step of specifying a plurality of voxels not containing said visual feature to the selected number of regions.

31. (new) The method according to claim 30, wherein duplicate rendering pathways are employed for facilitating the interactive sculpting.

32. (new) The method according to claim 31, wherein a down-sampled version of the volumetric dataset is employed during interactive sculpting.

33. (new) An article of manufacture comprising:

- a) a computer usable medium having computer readable program code embodied therein for extracting a visual feature from a volumetric dataset using an approximate volume, the dataset representing an image of an object, the computer readable program code in said article of manufacture comprising;
- b) the computer readable program code configured to cause the computer to display said dataset;
- c) the computer readable program code configured to cause the computer to receive input for defining a selected number of regions distributed displayed volumetric dataset, each of the regions containing a cross section of said object therein;
- d) the computer readable program code configured to cause the computer to generate through interpolation the approximate volume containing the selected regions, the approximate volume comprising a set of voxels selected from the volumetric dataset;
- e) the computer readable program code configured to cause the computer to specify a plurality of voxels not containing said object in said set of voxels to generate a mask; and
- f) the computer readable program code configured to cause the computer to use said mask for rendering said volumetric dataset to extract said object therefrom;

wherein selected number of regions are a subset of the total number of images contained in said volumetric dataset.

34. (new) The article of manufacture according to claim 33, wherein the function of the computer code for specifying the plurality of voxels is selected from the group comprising; specifying a region to be removed, and specifying a region to be visualized.